Robert Palevich

THE LEAN SUSTAINABLE SUPPLY CHAIN

How to Create a Green Infrastructure with Lean Technologies

The Lean Sustainable Supply Chain

The Lean Sustainable Supply Chain

How to Create a Green Infrastructure with Lean Technologies

Robert Palevich

Vice President, Publisher: Tim Moore
Associate Publisher and Director of Marketing: Amy Neidlinger
Executive Editor: Jeanne Glasser
Editorial Assistant: Pamela Boland
Operations Specialist: Jodi Kemper
Senior Marketing Manager: Julie Phifer
Assistant Marketing Manager: Megan Graue
Cover Designer: Alan Clements
Managing Editor: Kristy Hart
Project Editor: Betsy Harris
Copy Editor: Cheri Clark
Proofreader: Kathy Ruiz
Indexer: Lisa Stumpf
Compositor: Nonie Ratcliff
Manufacturing Buyer: Dan Uhrig

© 2012 by Robert Palevich
Published by Pearson Education, Inc.
Publishing as FT Press
Upper Saddle River, New Jersey 07458

FT Press offers excellent discounts on this book when ordered in quantity for bulk purchases or special sales. For more information, please contact U.S. Corporate and Government Sales, 1-800-382-3419, corpsales@pearsontechgroup.com. For sales outside the U.S., please contact International Sales at international@pearson.com.

Company and product names mentioned herein are the trademarks or registered trademarks of their respective owners.

All rights reserved. No part of this book may be reproduced, in any form or by any means, without permission in writing from the publisher.

Printed in the United States of America

First Printing January 2012

ISBN-10: 0-13-283761-7
ISBN-13: 978-0-13-283761-3

Pearson Education LTD.
Pearson Education Australia PTY, Limited.
Pearson Education Singapore, Pte. Ltd.
Pearson Education Asia, Ltd.
Pearson Education Canada, Ltd.
Pearson Educación de Mexico, S.A. de C.V.
Pearson Education—Japan
Pearson Education Malaysia, Pte. Ltd.

Library of Congress Cataloging-in-Publication Data

Palevich, Robert, 1945-
The lean sustainable supply chain : how to create a green infrastructure with lean technologies / Robert Palevich.
p. cm.
ISBN 978-0-13-283761-3 (hardback : alk. paper)
1. Business logistics. 2. Business logistics--Environmental aspects. 3. Technological innovations--Management--Environmental aspects. 4. Industrial management--Environmental aspects. I. Title.
HD38.5.P348 2012
658.7--dc23

2011041342

My book is dedicated to my loving parents,
Frank and Lucille Palevich,
for always believing in me.

Contents

Foreword xi
Preface xvii

Part I: Applied Savings to the Collaborative Supply Chain

Chapter 1 Lean Sustainable Technologies 1
Putting It All Together 2
Creating the World-Class Company 3
Lean and Green Savings Using EDI 18
Certification Program and Scorecarding 24
References 26

Chapter 2 Warehouse Management System (WMS) . . . 27
System Integration with the WMS 28
The Functionality of the WMS 28
Metrics Used in a WMS 31
Improve Inventory Management 34
The Improved Warehouse Worker Productivity 34
Improved Transportation Performance 35
Radio Frequency (RF) as a Warehouse Management System—An Introduction into RF Systems Used in the Distribution Centers . . . 38
The Importance of the Voluntary Interindustry Commerce Solutions Association to the Industry 42
The Applied RF Analysis: Receiving, Directed Putaway, Stocking, and Order Filling. . . 43
The Applied RF Metrics Used in the Distribution Centers. 46
References 47

Chapter 3 The Use of Radio Frequency Identity Tags in Industry 49
Case Studies of Two Industries: The Medical Environment and the Distribution Industry 60
References 75

Chapter 4 Transportation Management System (TMS) 77
References 95
Chapter 5 Savings of B2B E-commerce 97
The Vendor Portal 98
The Customer Portal 101
The Distribution Portal 107
Green IT 109
References 119
Chapter 6 The Introduction of Enterprise Resource Programs (ERP) 121
Business Processes and Analytics Features That Can Add to the ERP Software Solution . . . 124
CRM Features 125
Financials Features 126
Human Resource Management Features 127
Manufacturing Features 127
Supply Chain Management (SCM) Features . . . 128
The Quantifiable Benefits of an ERP System . . . 129
ERP's Sustainable Drive to Green 131
The Collaborative Sustainability Scorecard or KPI 133
References 135
Chapter 7 Third-Party Provider 137
Multimodal 138
Onsite Supplier 138
Network Optimization 139
Benefits of a 3PL 142
Lean Savings 143
Green Savings 144
References 145
Chapter 8 Inventory Control 147
Pareto ABCDE Classification of Inventory 147
Chapter 9 Promotional Forecast System 159
Lean Savings for Promotional Forecast Program 163
Chapter 10 An Introduction to Distribution Resource Management 165
Container Delivery Management 165

Chapter 11 Joint Order Allocation 173
Lean Savings 177
Green Savings 177
Chapter 12 Variable or Fixed Reorder Periods 179
Fixed Period Model (FP) 179
Fixed Order Model (FQ) 185
Variable Period and Quantity Model (VPQ) with Look-Ahead. 190
Chapter 13 Furthering Collaboration with Suppliers (CPFR) 199
The New CPFR Model. 201
Collaborative Transportation Management 212
References. 213
Chapter 14 Material Handling Technology, Voice Pick, and Pick to Light Technologies 215
Batch Order Summary Sheets 217
The Installation of the RF System 224
The Receiving Process and the Stocking Process . . 225
References. 237

Section I: Introduction to an Application of Lean, Green Supply Chain Management *External*
Chapter 15 The Visual and Visible Supply Chain 239
The Visual Supply Chain. 239
The Visible Supply Chain 242
Chapter 16 Master Data Alignment and Item Synchronization 245
References. 253

Section II: Introduction to an Application of Lean, Green Supply Chain Management *Internal*
Chapter 17 Internal Supply Chain 255
Environmental Facts. 255
Designing a Paperless Environment with Software. 255
Mobius Software: A Division of ASG Software 258
System Advantages 259
Oracle Content Management. 260
References. 273

Part II: Technical Sections

Chapter 18 A Technical Explanation of Forecasting Systems 275
The Algebraic Model 276
Multivariate Regression Models 278
Trigonometric Models 280
The Logistics Model 281
The Logarithmic Models 282
Exponential Smoothing 284
Dispersion of Demand 297
Finding the Correct Forecast Model 300

Chapter 19 Forecasting Methodology and Gamma Smoothing: A Solution to Better Accuracy to Maintain Lean and Green 305
Introduction of Gamma Smoothing 305
A Comparison Using Gamma Smoothing and Exponentials Smoothing 308
The Trend Section of Gamma Smoothing Using TI 312

Chapter 20 The Characteristics Needed in a Forecast Program 345

Chapter 21 The New Sustainable EOQ Formula 353
The Old Economic Order Formula 354
The New Economic Order Formula 361
The Green Effect of the New EOQ Formula . . . 366

Chapter 22 Consequences of the Industrial Revolution . . 369
References 374

Chapter 23 Different Organizations' Green Supply Chain Management and LEED 375
References 382

Chapter 24 Case Study: Sweetwater Sound 383
Sweetwater Case Study 383
References 388

Chapter 25 Case Study: Behavioral Health 389
Case Study of the Six Sigma DMAIC Approach in Health Care 390

Appendix A The Summary of the Lean and Green Technologies 407

Index 409

Foreword

Do it Best Corporation got its start back in 1945 as the vision of Arnold Gerberding. It was known then as Hardware Wholesalers, Inc. (HWI). Gerberding set out to build an entirely new way of serving the needs of independently owned hardware stores and lumberyards. From those humble early days of the co-op and just a few hundred members in the Midwest, Do it Best Corp. has grown into a $3 billion worldwide distributor of hardware, lumber, and building materials with close to 4,000 member locations and operations in more than 50 countries around the world. That growth would not have been possible without an industry-leading supply chain.

The company's first computer was purchased in 1964: an IBM 1401 with a whopping 8K of memory! It was out-of-date almost before it was turned on. Its capabilities were certainly limited, but it was an important investment in keeping up with the company's rapidly growing base of members. Its tasks were limited to maintaining a perpetual inventory, generating billings and packing slips, and other routine tasks. With upgrades to the "next generation" of computers, an IBM 360 in 1968 and an IBM 370 in 1972, the company soon realized that the new systems could be a powerful tool in the buying and replenishment function. The ideal system would be able to track merchandise movement, vendor performance, and customer requirements. At the heart of this was the need for an effective replenishment system that factored in lead times, customer demand, promotional impact, and seasonality to help maximize inventory turns and fill rate.

Enter Rob Palevich.

Rob started with HWI in August 1970. With his undergraduate degree in industrial management and computers and a master's in business administration, he was in the perfect position to take control of the company's inventory control efforts. Rob single-handedly developed the software for a unique automated order and replenishment system called FOURTE, or Forecasting and Ordering Using Regression, Time Series, and Econometrics. In 1981, HWI was able to put the FOURTE system into service as the industry's most sophisticated inventory control system, helping the company achieve fill

rates of close to 95% in its then four distribution centers. The system analyzed data for every item, vendor, and line of merchandise handled by HWI. It took into account product seasonality, regional differences, store purchase history, and more. The program could also adjust to increase an order to meet minimum dollar, weight, or cube requirements, and it could factor in manufacturing and delivery lead times as well. This extraordinary system did much more, from aiding in financial control to pinpointing problem areas and analyzing cash flow impacts. In short, Rob Palevich's development of FOURTE revolutionized the manner in which purchasing and distribution would be managed going forward and gave HWI another considerable competitive advantage in the marketplace.

The steady advancement in computer memory and processing speed provided Rob with strong, new tools and an ever-expanding canvas to further his development of the FOURTE system. As HWI became Do it Best Corp. and the company continued its rapid growth, FOURTE enabled it to maintain a fill rate in excess of 96% on more than 65,000 items in eight distribution centers with accuracy in excess of 99%. Not a bad effort for a young man who started out in the data processing department at $3.12 per hour!

Throughout his career, Rob has demonstrated a thirst for learning. Name a programming language and he's most likely studied it and used it. In 1998, he spearheaded an initial entry into e-commerce with the launch of doitbest.com. In 2001, Indiana University–Purdue University Fort Wayne (IPFW) recognized Rob with their Distinguished Service Award for his engagement with the University. He's also the only person in the company's history to have used the tuition assistance program to study two years of Chinese...not a surprise if you know Rob. But his passion all along has always been in improving the supply chain.

After 33 years of service, Rob retired from Do it Best Corporation but didn't stay idle for very long. He began a teaching career at nearby IPFW with a focus on SAP, enterprise resource management, and supply chain excellence. He quickly put his background and experience to work in the development of long-range radio-frequency identification tags. Rob is the founding director of the Business Enterprise System and Technology (BEST) Institute at the Richard T. Doermer

School of Business at IPFW, a center for knowledge management and networking in Northeast Indiana. He also serves as CEO of RP Global Technology Solutions.

Based on a considerable measure of practical hands-on experience and focused through a lens keenly trained on the future, *The Lean Sustainable Supply Chain* provides an important framework for developing a world-class supply chain that is both lean and green. It moves far beyond the basics of "inventory" management to the exceedingly more complex and content-rich environment of "information" management, and it provides a GPS map for the road to the future of the global supply chain. Even while Rob is officially retired, his talents and expertise continue to feed the success of Do it Best Corporation as they raise the bar on supply chain initiatives and strive to make the best better.

Robert N. Taylor
President & CEO
Do it Best Corp.

Acknowledgments

I am grateful for all the support I have received from so many people in writing this book. I credit Dr. Jim Moore from the Richard T. Doermer School of Business for encouraging me to participate in an International Symposium on the Green Supply Chain at Kent University. Winning the competition ultimately led to my decision to share my insights.

I want to convey many thanks to Jacqui Petersen, Bobbi Barnes, Cynthia Wilson, and Dr. Karen Moustafa Leonard for encouraging me to write a book and helping with initial editing. I also greatly appreciate the dedication of Renee Kosor, who worked tirelessly to complete the project.

I would like to give special acknowledgment to Robert N. Taylor, President and CEO of Do it Best Corp. I am humbled and sincerely appreciate the "glowing" foreword he penned for my book. I am indebted to his support and the opportunities I have enjoyed from working at Do it Best Corp. That background has enabled me to understand the intricacies of the supply chain command.

Last, but not least, I would like to recognize my wife, Bonnie, and family: Chris, Angie, Jessica, Rylee, and Maya. They have endured my long ordeal and interruptions even on vacation.

About the Author

Robert Palevich is a full-time professor at Indiana University–Purdue University Fort Wayne, Indiana (IPFW). His teaching areas are E-commerce and B2B, SAP and ERP, Lean Black Belt Six Sigma, Operation Management, Statistics, Discriminant Analysis Linear Programming, and Web Page Design. His research interests are Lean manufacturing and the Lean service industries, Six Sigma and process analysis, RFID, and the sustainable green supply chain.

He is the director of the Business Enterprise Systems and Technology Institute (BEST) at IPFW. The purpose of the BEST Institute is to inform, educate, and help existing companies attract new businesses and industries by creating a center for knowledge management and networking for all the companies in Northeast Indiana. With the cooperation of the BEST Institute and RP Global Technology Solutions, he received a $250,000 grant for the University from the Strategic Skill Initiative (SSI) for teaching the most relevant and current technologies.

Palevich is also President and CEO of RP Global Technology Solutions LLC. The company specializes in advanced technology for companies throughout the state. The technology includes RFID, Visual and Sensor Equipment, Six Sigma, ERP, Lean Manufacturing, Supply Chain, and CPFR technology.

Prior to teaching at the university, he has had 25 years of supply chain experience in logistics and enterprise resource planning at a $2.0 billion wholesaler (Do it Best Corp.) with 4,500 stores worldwide. His responsibility as CTO was to bring in all new Internet, Electronic Commerce, EDI, and Supply Chain Management (SCM) technology. He was involved with the development and integration of the Business Process Design (BPD) of the Supply Chain, Logistics, WMS systems, Knowledge Management (KM), Product Lifecycle Management (PLM), Supplier Compliance, and integrated workflow in Purchasing. He had collaborated with approximately 25 Fortune 500 companies in the process of developing certification standards between the respective companies and sharing technological innovations. He has

also traveled in North America, Latin America, and Asia in consulting and educational roles.

Palevich programmed the entire Supply Chain and Inventory Control Forecasting Program, which was named FOURTE, for Do it Best Corp. FOURTE stands for Forecasting and Ordering Using Regression, Time Series, and Econometrics. The company used this program for well over 10 years to enjoy the industry-leading service levels and inventory turns.

His education and background are as detailed here:

SAS INSTITUTE CARY NC:

- Completed *all* their classes for statistics, ETS Statistical Analysis, ANOVA, MANOVA, Box and Jenkins, ARMA, ARIMA, Time Series, Correlation Analysis, Categorical Analysis, Factor Analysis, Regression Analysis, Polynomial Regression, Non Linear Regression, Neural Networks

INDIANA UNIVERSITY: MBA

PURDUE UNIVERSITY: post-graduate research in Advanced Mathematics and Statistics. Dr. David Bendixon

INDIANA UNIVERSITY: MSBA

PURDUE UNIVERSITY: BS in Industrial Management

Certified by CompTIA in 2008 as an "RFID and Supply Chain Certified Professional"

Preface

This book is a summary of the experiences I have had working with many Fortune 500 companies such as GE, 3M, National Manufacturing, Sherwin-Williams, Black & Decker, Manco, and others on collaborative processes. The rationale for this collaboration was that in today's global economy each company needed to work together to enhance corporate processes to become "Best of Breed." It is amazing what can be learned from each company during yearly technology sessions when best technologies are shared so that every company reaps the benefits. The ideas and strategies explored in this book form a compendium of those best practices and shared technology over the past 25 years.

The inspiration for writing this book began when I won the award of first place in the case study track at the International Symposium of Supply Chain Management held at Kent State University in 2010. My specialty focused on applications that clarified the newest technologies with Lean initiatives and how those technological advances affect the Green environment. The purpose of this book is to break down the processes used in creating a world-class company so that any manager interested in cutting the fat can implement the technological advances now available.

This book will demonstrate how to calculate a scorecard for the various enterprise Lean technologies introduced and will act as a Lean Savings Report and a Green Sustainability Report including environmental savings. The Lean Savings will show the increased productivity incurred from the usage of the various technologies. The Lean metrics will show how much each of these technologies saves in these areas:

- Personnel
- Paper usage
- Increased productivity
- Lessened building space, allowing for less utility usage
- Fewer miles traveled in the transportation system
- Better service levels

- Increased margins
- Lower inventory levels
- Better turns
- More efficient utilization of IT resources
- Better morale

The environmental Green Savings include the following:

- Less electrical usage due to the need for fewer employees
- Carbon savings as a result of the decreased electrical usage
- Smaller amounts of paperwork, translating into fewer trees cut down per year
- Lesser amounts of carbon dioxide being emitted and using fewer trees resulting from lean management styles and technology
- Fewer miles driven due to the use of the Transportation Management System lead to a reduction in the pounds of CO2 footprint in the environment.
- Less highway wear and tear as a result of fewer miles traveled
- Less space utilization, requiring less building expense and upkeep

Each technology is introduced so that the reader not only understands how to implement each improvement but can measure the successes through increased company performance as well as environmental Green Savings. The formulas are presented to calculate the annual decrease of carbon dioxide and conversion of gasoline from gallons to pounds of CO_2. This is shown in the introduction of each technology. At the end of the chapters, Appendix A summarizes the savings that points out each technology's effect on the company's bottom line and performance. The time has come to learn to adapt to new innovations and enhance shareowners' benefits and profitability.

1

Lean Sustainable Technologies

The supply chain is composed of all the parts of the enterprise and its associated trading partners. The Lean Green Supply Chain is made up of two major components: external and internal. There is a synergy between these two parts. The internal savings can, in some cases, be equal to the external supply chain savings. To exclude the internal improvements that supplement the productivity of the External Lean Supply Chain is to miss out on a major component of long-term sustainability.

The external side represents the suppliers and customers throughout the supply chain. Collaborative technologies and software can be used to minimize the cost of the organization and decrease the company's carbon footprint. Forecasting procedures reduce the variation in systems processes in their connection with suppliers and customers in the external supply chain. Improving forecasting methodology through the implementation of Gamma Smoothing increases accuracy in forecasting and stimulates savings.

The typical EOQ (Economic Order Quantity) considers mere receiving and carrying costs in the warehouse. The new EOQ model moves companies beyond current warehousing needs and into the external environment. Through the incorporation of inbound and outbound freight, the EOQ model increases forecasting accuracy, leading to cost reduction throughout the external supply chain.

The internal supply chain is composed of the technologies that can be used to make the corporation and its employees more productive. Implementation leads to lowering the amount of space and resources necessary to perform the job. This represents the definition of Lean and Green sustainability. The sustainability effort needs to

incorporate workflow technologies and the use of software to minimize the use of paper and other costly resources.

Putting It All Together

Now it's time to enter customers and suppliers into the equation of collaboration. The most important consideration at this point is what is best for the entire supply chain. This can be emphasized only by involving the other suppliers and customers. What is good for one may not work for all. For example, 10% of the United States GDP (Gross Domestic Product), which was $14.26 in 2010, is involved with supply chain. Today's companies are realizing that the competition is not with their competitors but with competing supply chains.

According to a study by consultants A.T. Kearney, inefficiencies in supply chains can waste up to 25% of a company's operating costs. In companies with profit margins of 3% to 4%, even 5% improvements in supply chain efficiencies focusing just on material flow can double profit margins.[1] The supply chain is the greatest cost in today's industry and consequently has the best chance for the highest return if the process can be further improved.

One measure of the ability of a company to enhance its standing among the competition is the metric called Gross Margin Return on Investment (GMROI). GMROI looks at a company's quantitative ability to compete. GMROI is the gross margin percentage of a company multiplied by the inventory turns of that company. Turns are the term used to convey how well a company turns its inventory. Turns = while GMROI = GM × Turns. If two companies have the same gross margins, with one company's inventory turns being 50% better than its competitor's, the company with the higher turns is making more profit for the enterprise. For example:

> *Company A* has a gross margin of 20% and has 3 inventory turns. The GMROI throughout the year on their inventory investment is an average of 3 × 20% = 60%.
>
> *Company B* has a gross margin of 20% and has higher inventory turns of 4.5. Company B's GMROI is 4.5 × 20% = 90%.

Company B is making 90% on its inventory investment for the year. It is also making more money on opportunity cost because company B has 50% fewer inventories held as compared to Company A. This frees up capital or expenses if loans are involved. Company B can now afford to sell at a lower cost and also sell more expensive alternatives at lower prices.

Sustainability is meeting the needs of the present generation without compromising the needs of future generations. For every $1,000 spent on Lean Technologies, there is a Green payback of approximately $426, which includes savings in the environment. The greatest Green Savings is found in the transportation highway infrastructure yearly maintenance costs. Removing the cost of the transportation infrastructure from the scenario still provides for approximately $280 savings for every $1,000 spent on Green. The payback is well worth the cost, not only in dollars but also in sustainability.

Creating the World-Class Company

The following sections describe the initial components to create a world-class company. We begin with resource management, the management of resources to differentiate the company from competition. This is followed by the second part, which is forecasting the future enterprise inventory requirements. This is not just about the forecasting methodology but also integration and collaboration within the value chain. The term *value chain* is used to make notice of all the savings within the supply chain, savings that can separate your firm from the competition. The collaboration was made possible with VMI (vendor-managed inventory) and certification programs. The topics of EDI (electronic data interchange) and the various transaction sets are used for infrastructure integration and automation. At the end is a summary of the lean and green benefits.

Step One: Resource Management

The global competition is changing for the entire set of business paradigms. Today's companies need to be more competitive, flexible,

innovative, and lean because of increased global competition. It is not a privilege to make a profit today, it is an expectation of stakeholders—employees, banks, government, and suppliers. The global recession has forced companies to cut costs and look for new, innovative ways to do more with fewer people. This has brought on the concept of Innovation Management, the need to think creatively and find better ways to be more productive. This differentiates a company from its competition.

How can a company remain innovative enough to separate itself from the competition? This was Steve Job's major mantra when he came back to Apple Corporation in 1997. Apple needed to catch up with the competition: IBM. At the time, people needed something different to overcome their fear of computers. Steve's comment to the team at Apple was, "Apple cannot keep trying to get one step better than their rivals. They must be innovative and make something different." This was the start of Apple's comeback with the introduction of the iMac.

The iMac was the first computer that looked friendly and came in bright, vivid colors. This simple change brought about the start of Apple's great growth pattern. The popular belief is that if Apple would have waited an additional year, they would have been doomed. Another example of Apple's innovative philosophy involved asking their employees to spend 20% of their time thinking creatively. The employees sat in a comfortable room, separate from their work area, to explore ideas that were new and innovative.

Charles Darwin said, "It's not the strongest species that survive, or the most intelligent, but the most responsive to change." Innovation Management is the concept of trying to create the most innovative atmosphere in the company that's possible. How do employers teach people to think beyond the box? One way to facilitate this is to have the managers go to one or two conferences focusing on areas where improvement is needed each year and then return to share their knowledge with the rest of the staff.

Staff training is a good time to facilitate affinity analysis. This is the concept of recording the ideas on a chart so that the information is easily seen by the group. The information flow can be categorized and prioritized by importance. An overriding theme for each innovative

improvement is to improve the product by changing the playing field on the competition. Implementing an open training forum makes it harder for competitors to ramp up in a new direction. By the time they catch up, the innovative management team is already on the next playing field.

Innovation Management will not succeed without Talent Management. Creativity and innovation are viable only when the most talented people in the organization are placed into an atmosphere conducive to thinking outside the box. Google understands this concept and touts the practice on their Web site of creating "an atmosphere that, when they had hired the most talented people, they, in turn, did not want to leave. This not only refers to not leaving for another job, but also refers to wanting to spend more time at work. The employees actually enjoy being at work." Innovation Management drives talented people to companies that practice this method.

Employee retention requires a top-down attitude of Talent Management. Creating a desirable work environment might mean providing on-site health classes such as yoga, offering local gym memberships, or bringing in guest speakers to focus on personal and professional improvement. The benefit to the company includes decreased health-related absences, lower health-insurance costs, and increased camaraderie among the staff. For employees in manufacturing or distribution, injuries such as carpal tunnel syndrome are commonplace. The wellness program can help lower the incidence of medical claims.

The final piece of the Talent Management puzzle is the profit-sharing program. Profit sharing creates a personal stake in the success of the company, which increases employee productivity. Do it Best Corp. has instituted a profit-sharing program that led to one of the highest retention rates in the industry. Their profit sharing today is over 20% of employee pay, which has increased staff involvement in cost-cutting methodology.

After the talent is in place, the next necessary step is to spark the innovative talents of the staff by creating an atmosphere of Change Management. The key element in Change Management is continuous improvement through motivating employees to consider change a benefit and to embrace each one as a new challenge. This is done with the introduction of continuous improvement concepts. These

improvements can be introduced to the employees in a discussion forum, which allows them to confer with others on the viability of each concept.

For example, the manager's job is to find the why and how of extra inventory problems. Employees have the answers and a good manager seeks those answers through the philosophy of Management by Walking Around (MBWA). Managers who are there to listen allow subordinates to be more open to sharing improvement ideas. Sometimes the best ideas come from informal conversations with employees. Employee objectives should be made visible through the use of scoreboards throughout the office and communicated through weekly meetings. The objectives are then used to create constant awareness in the way each step is taken in the supply chain.

Employees who are rewarded with incentives are more likely to consider corporate objectives and improved processes. Acknowledgement of critical milestones through the creation of public displays promotes the team players who can be imaginative. Companies that nurture the spirit of thinking beyond the box open communication and encourage and reward new ideas. The corporate culture of new idea generation requires constant nourishment. It also requires the right people who are self-motivated and willing to work with others.

An additional but essential part of Change Management is execution. There are too many CEOs and directors not clearly tied to their goals. Their pay and bonus structure does not reflect the performance and profitability of the company. To move with the times, execution must reflect from the top of the organization down to the production floor.

Companies have prospered through the generations with each technological advancement:

In 1910: Mass production

In 1960: Lean technologies

In 1980: Flexibility through computerization

In 1990: Reconfiguration

In 2000: Knowledge management

In the era of knowledge management, the leaders must grow creatively to unlock the potential of the personnel. The only way to perform this is through Execution Management. Steve Jobs of Apple Computers envisioned the Mac computer, iPod, iPhone, iPad, and iTunes. He knew how to execute the vision and make it happen. Allen Mulally of the Ford Motor Company turned Boeing around and then transformed Ford with its new styling and innovative models.

Execution is giving the personnel direction and a vision of what needs to be accomplished. A company can empower employees to succeed by enabling them to make the vision possible while motivating them to use their talents to execute the vision. Execution is making things happen that delight the customers and shareholders.

Technology is changing the environment, allowing companies to execute in an even more expeditious fashion. There are four trends that make this possible:

1. Development of an ERP (Enterprise Resource Planning) environment. All knowledge in real time and all from the same source. Information is more accurate and relevant, which expedites decisions and informs all interested parties of progress.
2. On-demand, which means going to the next-generation real-time management systems called SAAS, or Software as a Service. The user is billed and pays only for what is used. This software is more pervasive than the old-style ERP systems. It is assumed that the software will be downloaded from the Internet in a cloud, ASP (Application Service Provider), or App Environment. Now information analysis can be more readily available on all data realized from the ERP system above.
3. BI, or Business Intelligence, which is software that is inbred into a DSS, or Decision Support System. This expands the horizon of the two preceding steps. Analysis is achieved with the on-demand software, and the information received will translate to knowledge for the corporation through the use of Business Intelligence. It allows the intellectual capacity of the analytics system support to aid the managers in decision making and risk analysis. This difference is what separates the leaders from the followers.

4. On Device, or mobile, which means that the employee can be engaged anytime and anyplace. This has started the new generation of the always-on, always-connected world. These devices will transform the business industry. Now when decisions need to be made immediately, communication between management and staff will not be put on hold. The decisions can be made more expeditiously.

After the team is in place, the Lean Green journey can continue through the management paradigm and begin again with Innovation Management. Innovation Management works best when Talent and Change Management techniques are implemented in unison. For instance, when a new forecast system was needed to streamline the purchase of 55,000 items, innovative management sought out the most qualified employee and worked with him to allow his creativity to produce the technology necessary to create the system. He was permitted to leave the job site daily at noon and work at the location of his choosing for six months.

From a table at a local coffee shop, this employee coded the Forecasting and Ordering Using Regression, Time Series and Econometrics (FOURTE) system. When implemented, FOURTE allowed the company to differentiate itself from the competition by attaining the industry leadership in turns and service level. The system increased productivity by a factor of 16. The same employee was later offered the opportunity to design the only promotional forecast system in the industry using SAS as the analytic engine. Without an attitude of innovation, this company would have missed out on long-term sustainability and an unmatchable competitive edge.

Today's successful company involves each department in the corporation as well as customers and suppliers along the supply chain. Collaborative versions of technology software such as ERP II (Enterprise Resource Planning) and MRP II (networked closed-loop manufacturing requirement planning) are networked with accounting financials and other departments such as Human Resource, Distribution, and Marketing. The one overriding feature is that there are no more silos for independent enterprise software. The common thread in creating the world-class corporation is determining how each decision affects

every point in the supply chain, as well as knowing what is best for the entire company.

Step Two: Forecasting the Future Enterprise Inventory Requirements: Best of Breed Forecast Systems and the Supply Chain

Vendor-Managed Inventory

Vendor-managed inventory (VMI) is an agreement between the supplier and the retailer of merchandise. The retailer must give the usages, on-hand and on-order information to the supplier so that they can take full responsibility for maintaining the retailer's inventory. This is usually in the form of an EDI (electronic data interchange) transaction set 852. The supplier now has the goal of balancing the demand and supply side of the equation for the retailer. A 3PL or third-party logistics provider can also be used by the retailer to augment the success of the VMI program by maintaining better control of the inbound and outbound traffic.

In the traditional relationship, the distribution centers stock their warehouse with products from the supplier and the orders are based on demand forecast from the supplier. The vendor could also stock stores in a similar fashion, in which case the supplier could bring in extra storage, displays, or promotions. The vendor may have to pay a slotting fee for storage in the retail store, but it is worth the time and expense because it increases sales and profits due to the added visibility of product. The product can also be delivered on a consignment basis, which means the product is owned by the vendor and the retailer does not have to pay for the inventory. This is great for the retailer because they garnish the sales from the additional product and pay for the items only when they are sold. The supplier, in turn, bases forecasts and inventory levels on past orders from the retailer.

In a VMI arrangement with the retailer, the supplier may take over the inventory functions that the customer managed. In this scenario, the supplier responsibilities include the following:

- Providing the racking or bins for the storage. This also includes all signage and advertising media.

- Determining how the merchandise will be displayed. Is it an end-cap or a dump bin?
- Determining the receiving schedule for inbound receipts. This needs to be approved by the retailer of the distribution site.
- Maintaining all inventory transactions. This needs to be very visible with the retailer and supplier.

In the traditional relationship, the customer has an incentive to keep inventory lean by placing small, frequent orders. This is called the just-in-time (JIT) concept. This ensures that the customer maintains an acceptable fill rate and a low inventory level. When this concept is used, it is necessary to be cognizant of the increased cost of added transportation and receiving.

With the Green variable for the supply chain, the vendor will not have to ship the product as often as the just-in-time arrangement from the retailer. This saves in mileage traveled by the manufacturer, and the extra inventory is stored in one facility, usually owned by the supplier. This facilitates smaller warehouses on the retailer's side and smaller supply chain inventories because it is not stocked heavily in many locations.

The onsite supplier (OSS) can measure the climate of each sale and get closer to the customer. This is very important when the vendor is looking for new product information or is looking for better information for a promotion. The keys to making VMI work is shared risk. Often if the inventory does not sell, under the VMI partnership the supplier will repurchase the product from the buyer (retailer). In other cases, the product may be in the possession of the retailer on consignment. This can dramatically increase the turns of the buyer's inventory. The general definition of turns is :

$$\frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}$$

Let's say the average inventory is 1,000 units and sales per year equal 4,000 units. If T = 4 then there is an average of 1/4 of the year's inventory on hand:

$$\frac{1000}{4000} = \frac{1}{4}$$

When inventory is consigned, it is written in the books as sold only when the sale takes place. If a business is open 360 days a year, the item is owned only for the day it sold. The turns for the consigned inventory equal 360.

Lowes has an agreement with its suppliers on large appliances to be the marketing representative of brands such as LG. After the customer buys the product, it is shipped out of LG's warehouse and delivered to the customer by Lowes. This is a great savings in inventory because the product is not stored in two places, it is stored only at LG's facility. This is a great savings in the total aggregate supply chain.

Consigning inventory is expanding into industries such as the HVAC (Heating, Ventilation, and Air Conditioning) industry. The HVAC service companies have the parts inventoried by the parts distributors in their warehouse. If the HVAC company gets a job, their service representatives go to the appropriate distributors to pick up the product and then go the customer to fix or service their heating or air-conditioning systems. This saves the HVAC company from having to store its distributor's entire inventory in the warehouse.

If they did store the material, there would be a duplication of inventory in the supply chain. Companies may enter into an arrangement with the suppliers that 20% of the items that represent 80% of the sales could be stored with HVAC's distributors. This could represent 50% to 60% of the HVAC's inventory. The VMI partnership helps foster a closer understanding between the supplier and the manufacturer by using EDI formats. EDI software and statistical methodologies are used to forecast and maintain correct inventory in the supply chain.

Vendors benefit from more control of displays and more contact to impart knowledge to employees, thus enhancing the growth of the partnership. The retailers benefit from reduced risk, better store staff knowledge (which builds brand loyalty for both the vendor and the retailer), and reduced display maintenance outlays. Both vendor and retailer or distributor benefit by the usual once-a-year technology meeting in which both partners share their knowledge of the best-of-breed technology in the companies. The overriding theme for these conferences is that both parties realize that if they help each other the whole will become better than the sum of the parts.

Consumers benefit from knowledgeable store staff who are in frequent contact with manufacturer (vendor) representatives when parts or service are required. Employees with greater knowledge of the products offered by the entire range of vendors have the ability to help the customer choose from competing products for items most suited to them. This actually increases the manufacturer's sales because the retailer's employees are more knowledgeable about the supplier's product line. They can suggest items that they had no knowledge of in the past. In a VMI partnership, manufacturers stand to increase sales by 3% to 4%.

An additional reason to use VMI is to add compliance and optimization into the supply chain. There are a number of technologies available, but the main issue is to optimize collaboration between trading partners. Vendor Managed Inventory will also minimize the "bullwhip effect." The bullwhip effect is variation in demand caused by poor communication between the retailer and the manufacturer. Its name originated with Wal-Mart and PG's VMI program.

Do it Best Corp. has about 5,000 vendors and approximately 4,000 customers. The VMI vendors were chosen using the Pareto approach, considering which vendors had the biggest bang for the dollar: the 20% that contributed 80% to sales. These vendors are usually the most sophisticated and able to enter into long binding partnerships with the company. In most cases, an EDI network is needed to make sure that the data is sent and received in real time and accessible by all parties involved.

Certification programs will become more and more necessary when entering into these long-range contracts. They help in establishing standard operating procedures (SOP) among trading partners. This is essential to realizing the truest form of economy of scale with manufacturers. There must be a grading scale to guide future progress and maintain balance with numerous VMI trading partners. A sample document for the VMI or VMI partner response to the suppliers is shown in Table 1-1. This form is to be used in the certification process for the suppliers. It is a list of rules they must follow to be included in the certification program.

Table 1-1 The VMI Partner Document

XYZ Distributor Vendor Managed Partnership Form The Supplier Portion	
VENDOR NAME _____	RDC SHIPPED TO: _____
VENDOR NUMBER _____	VENDOR SHIP POINT: _____
EMPLOYEE NAME _____	DATE SHIPPED: _____
	CARRIER: _____
1. UTILIZE A GOOD QUALITY, SOLID HARDWOOD OR PLASTIC PALLET FOR MERCHANDISE.	
2. SHIPMENT PRESORTED AND SEGREGATED SO THE SAME SKUs REMAIN TOGETHER.	
3. MERCHANDISE SHRINK-WRAPPED.	
4. PALLET MARKED/LABELED: "DO NOT BREAK SHRINK WRAP."	
5. MIXED CARTONS ARE IDENTIFIED WITH MANUFACTURER'S NUMBER AND QUANTITIES ON THE OUTSIDE OF THE CARTON. ALL SKUs SHIPPED IN CASE PACK QUANTITIES WHEN QUANTITY ORDERED PERMITS.	
6. PALLET CONTENTS IDENTIFIED: ITEMIZED ON PACKING LIST OR PLACARD ATTACHED TO THE PALLET.	
7. PACKING LIST ATTACHED TO FREIGHT.	
8. THIS QUICK-RESPONSE COMPLIANCE FORM ATTACHED TO CARRIER DELIVERY DOCUMENTS OR PLACED INSIDE A HIGH-VISIBILITY ENVELOPE & ATTACHED TO PALLET #1.	
9. SECOND PACKING LIST PROVIDED WITH CARRIER DELIVERY DOCUMENTS OR PROVIDED TO ACE VIA EDI (ADVANCE SHIP NOTICE).	
10. CARRIER BILL OF LADING PRESENTED AS: "SO MANY PALLETS SAID TO CONTAIN SO MANY CARTONS."	
11. MERCHANDISE SHIPPED ON A PREFERRED CARRIER.	
12. PALLETS CONTAINING MIXED SKU MERCHANDISE STACKED TO A HEIGHT OF 60" OR LESS (FROM FLOOR TO TOP OF MERCHANDISE).	
13. PALLETS CONTAINING SINGLE SKU MERCHANDISE STACKED TO A HEIGHT OF 42" OR LESS (FROM FLOOR TO TOP OF MERCHANDISE).	
XYZ RETAILER PORTION	
RECEIVER I.D.: _____ _____	No. OF POs: _____
DATE RECEIVED: _____	ACE PO#: _____
NONCOMPLIANCE ISSUES:	CHECK IF LOAD WAS BROKEN DOWN BY CARRIER:

The Savings of EDI

Electronic data interchange (EDI) is used to transfer electronic documents or business data from one computer system to another computer system. In the following explanation, data is exchanged from one trading partner to another trading partner without human intervention.

The Internet provides a means for any company, without regard to size or location, to become part of a major supply chain initiative hosted by a global retailer or manufacturing company. Many companies around the world have shifted production of labor-intensive parts to low-cost, emerging regions such as Brazil, Russia, India, China, and Eastern Europe. Web-based EDI, or WebEDI, allows a company to interact with its suppliers in these regions without the worry of implementing a complex EDI infrastructure.

In its simplest form, WebEDI enables small to medium-sized businesses to receive, turn around, create, and manage electronic documents using only a Web browser. This service seamlessly transforms data into EDI format and transmits it to the trading partner. Simple prepopulated forms enable businesses to communicate and comply with the trading partners' requirements using built-in business rules. Using a friendly web-based interface, EDI transactions can be received, edited, and sent as easily as an email. No third-party software installation is necessary. The only requirement is an Internet connection. WebEDI is accessible anywhere in the world and does not require a dedicated IT person to manage software.

Some examples of the processes automated by EDI are represented by a term transaction set. The transaction set is the data formatted and sent for a particular process. The different transaction sets have a numerical name such as 810 for an invoice. Some of the examples of the common transaction sets used are the following:

- Purchase order is sent electronically with a transaction set called an 850. This will allow the sending of all purchase orders electronically to the supplier. Paperwork is minimized and employee productivity enhanced.
- Invoices are sent electronically through transaction set 810. All invoices can be sent back from the supplier electronically. These invoices are from the electronic purchase orders received at an

earlier date. The invoice is also considered a turnaround document. (A turnaround document refers to the time period after the purchase order is sent to the time the data is turned around as an invoice, the document that follows the purchase order. An invoice follows the purchase order after its receipt and the advance shipping notice is created after the purchase is loaded onto the truck for shipping.) The purchasing invoice cycle is now done electronically.

- Advance Ship Notice (ASN) is sent electronically through the transaction set 856. Receiving can be planned in advance due to the advance ship notice of what is coming in from each supplier using the ASN. Some products are hard to put away and need a specialized staff. With the ASN, it is easier to determine which trucks contain the vendor products, so staffing becomes easier. Second turnaround documents are used when a supplier receives the purchase order electronically. After a PO is received, the supplier turns around and sends the other two documents. They then ship the product and send the ASN electronically, allowing companies to reduce the paperwork requirements.
- Transportation Carrier Shipment Status Message is sent electronically through the transaction set 214. This transaction set is used to schedule a carrier into the dock. The carrier will use the 214 transaction set to notify their arrival, making arrival time approximately 90% accurate to the hour. Now a closed-looped environment has been created. Each truck is identified by the Shipment Status transaction and given a status of their location and time of delivery. Receiving is now scheduled proactively.
- Payment Order/Remittance Advice is sent electronically through the 820 transaction set. A remittance advice is a letter sent by a customer to a supplier to inform the supplier of invoice payment. If the customer is paying by check, the remittance advice often accompanies the check. Remittance advices are not mandatory; however, they are seen as a courtesy because they help the supplier's accounts-receivable department match invoices with payments. The remittance advice should therefore specify the invoice number(s) for which payment is tendered. Modern systems will often scan a paper remittance advice into a computer system, where data entry will be performed. Modern remittance advices can include dozens or hundreds of invoice numbers and other vital information. The primary purpose for the remittance advice is to let the supplier know when and how

much was paid and when it will arrive. This helps greatly in the balancing of cash flow from a vendor standpoint.

- MSDS (Material Safety Data Sheet) is sent electronically through transaction set 848. The transaction set can be used to communicate chemical characteristics, hazards, and precautions for the safe handling and use of a material. The transaction set is intended to convey the information required for an MSDS as defined by the Occupational Safety and Health Administration (OSHA). The MSDS provides the receiver with detailed information concerning material identity, emergency response, chemical and physical characteristics, toxicology, and industrial hygiene procedures.
- Price Information Transaction Set is called the 879. The transaction set contains the current price or price changes to the customer for documentation or for their electronic catalog.
- Price/Sales Catalog is sent through transaction set 832. The 832 EDI document type is used to provide a trading partner with a report of vendor product data for ordering purposes while maintaining an established practice in furnishing trading partners with prices of goods or services in a catalog. The 832 Price/Sales Catalog has four major functions: catalog operation, a traditional vendor catalog, item setup and maintenance, and sales price communication. After the 832 Price/Sales Catalog is received, a 997 Functional Acknowledgment is sent back from the transportation provider indicating that the Price/Sales Catalog was successfully received.
- Traditionally Scan Based Trading programs use EDI solutions as the key component to synchronize information on store locations. Here are a few of the transaction sets:

    - Organizational Structure 816—This transaction set can be used to transmit pertinent information about a parent organization, its members, and the relationship of a member to another member and/or to the parent organization. The transaction set contains some of the following information: address, geographical location, contacts, and identity code. The identity code is the D-U-N-S numbers and the supplier company numbers, which may be internal numbers to identify the individual companies, buying units, and suppliers.
    - Items Price/Sales Catalog 832—This transaction set is used to update an electronic catalog or share pricing with the buyer or seller. It has the following components: item

identification, data time reference, restrictions and conditions, product description, item physical details, pricing information, bracket pricing, currency, address information, and geographical information.

- Price Information 879—This transaction set can be used to enable a manufacturer, a supplier, a broker, or an agent to provide a trading partner with pricing information. The transaction set is also used in setting up new items in a store. When a new item is set up, Item Maintenance Transaction Set 888 is needed. The details are similar to those for the Items Price/Sales Catalog 832.
- Item Maintenance Transaction Set 888—This transaction set is used to enable a manufacturer, a supplier, a broker, or an agent to provide detailed finished goods product information to a partner. This transaction set can be used to provide information about new products or changes in existing product specifications.
- Daily Sales Product Activity Data 852—This transaction set gives the supplier or user information about the movement of the product. This transaction set is used when performing VMI or QR quick response with trading partners. It has the following fields: Item on Hand per Location, Item on Order per Location, Item Usage per Location, and Item Backorder per Location.
- Receiving's Receiving Advice 861—The transaction set can be used to provide for customary and established business and industry practice relative to the notification of receipt or formal acceptance of goods and services. It uses the following fields: Currency, Date Time, Purchase Order Reference, Carrier Details, Carrier Routing, Carrier Special Handling, Geographical Information, and F.O.B.-Related Information.
- Organizational Structure 210—The Motor Carrier Freight Invoice transaction gives the location of the delivery, and from this you can determine its approximate delivery time. This is extremely useful in planning for the receiving staff and also for customer notification of product delivery.
- Forecast Planning Schedule 830—This is one of the innovations that sets us apart from the competition. The transaction set tells the supplier what we will be selling on promotions with anticipated volume. The supplier can plan its MRP processes better, and our service levels are greatly enhanced.

Summary of the EDI Transaction Sets

Transaction set 856: Advance Ship Notice
Transaction set 810: Invoice
Transaction Set 210: Motor Carrier Freight Invoice
Transaction set 214: Transportation Carrier Shipment Status
Transaction set 820: Payment Order/Remittance Advice
Transaction set 850: Purchase Order
Transaction set 848: Material Safety Data Sheet
Transaction set 879: Price Information
Transaction set 832: Price/Sales Catalog
Transaction set 997: Functional Acknowledgment
Transaction set 816: Organizational Structure
Transaction set 888: Item Maintenance
Transaction set 852: Daily Sales Product Activity Data
Transaction set 861: Receiving's Receiving Advice
Transaction set 830: Forecast Planning Schedule

Lean and Green Savings Using EDI

This section covers the metrics and savings that can be actualized through the implementation of the Vendor Management Program and electronic data interchange. The use of these tools requires a trusting relationship between the trading partners, but the return for both is significant. When a VMI vendor is added, that vendor needs to be on the same certification program. The VMI productivity increase is composed of three parts:

1. The EDI savings on the Advance Ship Notice, Purchase Order, and Invoice
2. The VMI Reduction of Inventory
3. Productivity Increase in
   a. Sales,
   b. SKU count, and
   c. Increased Service Level for Promotional and Seasonal Items

The following is a list of some of the important EDI automation savings used in VMI.

The Advance Ship Notice (ASN) transaction set 856 offers a view of the contents of the goods arriving on the carrier in advance of the delivery date. Using this document alone has allowed Do it Best Corp. to realize a 15% increase in labor productivity in the Receiving Department and a labor savings of 7 people × .15 = 1.05 person labor hours. At $18 per hour and with additional benefits of 25%, direct labor savings is $46,800 per year. This assumes the need for one less person in receiving.

The ASN can replace the Purchase Order (PO) when the vendor is doing the planning for the customer as in VMI. The ASN shows what is coming in, and this document can be used to pay the invoice. Payment is made through the ASN. The *Supply Management Handbook* says, "It often costs organizations more than $100 in administrative expenses to generate a purchase order" and adds, "In many firms, the cost of managing and generating a purchase order can exceed $200 per transaction." The analysis conducted by Do it Best Corp. found that paper purchase orders can range from a cost of $50 per manual paper purchase order to $1.50 electronically. The solution to their success was to integrate as many transactions with the supplier as possible.

(Note: The tables in Chapter 4, "Transportation Management System (TMS)," are used in the following analysis.)

There were 1,625 × 9 = 14,625 purchase orders per month. The average PO is three pages. This is 14,625 × 3 = 43,875 pages per month or 526,500 pages per year. Normally 500 sheets weigh five pounds, which means that 5,265 pounds of paper were consumed per year. A tree produces roughly 800 pounds of paper. So performing the calculation:

$$\frac{\left(\frac{526{,}500}{500}\right) \times 5}{800} = 7$$

shows that the purchase order process consumed seven trees per year (see Table 4-4 in Chapter 4). There are 175,500 pages of invoices per year. The invoice has miscellaneous credit memos and other

explanatory pages with and following the invoice statement. In estimation, the number of pages in the invoice process is about the same as in the PO process. Knowing this, we can calculate that seven additional trees are consumed in the invoice process. The total savings is 7 + 7 = 14 trees per year for automating both the PO and the invoice process.

In manufacturing paper, the wood is turned into pulp. The yield is about 50%—about half of the tree is knots, lignin, and other material not used to make paper. Therefore, a pine tree yields about 805 pounds of paper. A ream of photocopier paper weighs about 5 pounds and contains 500 sheets (paper is often seen described as "20-pound stock" or "24-pound stock"—which is the weight of 500 sheets of 17" × 22" paper). Using these measurements, a tree would produce (805 / 5 × 500) = 80,500 sheets of paper (see Table 4-4).

Lean and Green EDI Savings of the Advance Ship Notice, Purchase Order, and Invoice

Using the ASN to replace the purchase order and invoice for the VMI vendor results in Lean Savings:

- The electronic purchase order system saves $525,500 per year compared to the manual purchase order procedure.
- The electronic invoice system saves $1,228,500 per year compared to the manual invoice procedure.
- The ASN allows a 15% increase in labor productivity in the Receiving Department. This is a labor savings of 7 × .15 = 1.05 person labor hours. This means reducing the number of employees needed by one. At $18 per hour and with additional benefits of 25%, direct labor savings is 1 × 1.25 × 40 × 52 × $18 = $46,800 per year.
- The Lean Savings is ($525,500 + $1,228,500 + $46,800) = $1,800,800 per year.
- The Green Savings amounts to 14 trees per year being saved. Using Table 4-7, we can see that 14 trees equates to 910 pounds of CO_2 saved per year.
- Total savings so far is $1,800,800 per year + 14 trees + 910 pounds of CO_2 saved per year.

These savings can be used as productivity metrics for personnel or management. Visual Supply Management increases the productivity of personnel, using better and timelier information from the suppliers. For instance, in the past, it took all day for a purchase agent to review a very large vendor manually for all nine of the Do it Best Corp. warehouses. It can now be reviewed in 5 minutes. The only things to review on the VMI vendors are the turns and service levels for each warehouse. As long as the turns and service levels are increasing, they are increasing profit and sales for the company. This also shows that the supplier is doing a better job of demand forecasting if the turns are going up (more sales for less inventory) and the out of stocks are going down (more revenue with less inventory). The increase in labor efficiency is 400% using the collaborative electronic system. Employees can be deployed to more profitable jobs. Installing a VMI system does not create success by itself. Other processes are needed to enable the technology. These processes include the technologies discussed throughout this book.

Eight people are involved in the purchasing/invoice system. With a 400% increase in productivity, two are currently required. 3,060 kWh × \$0.16 = \$490 dollars were saved in electricity usage by reduction of computer usage for the purchasing group. Similar productivity improvements allow for the creation of a company with 50% fewer personnel than the competition.

VMI collaborative metrics for the supply chain include a 400% increase in staff productivity. There is also a 30% to 50% increase in turns. If there exists a \$300 million inventory, assuming a 35% increase in turns, \$78 million in inventory dollars are freed to be invested elsewhere. Using this method, Do it Best Corp. created a sales increase of 3.5% with no increase in inventory levels, a 25% increase in SKU count with no increase in warehouse space, and customer service levels of 97% or more on promotional and seasonal items, as well as significantly reduced paper-handling costs.

Do it Best Corp. originally had three turns with \$300 million average inventory and \$900 million in sales. At 35% increase in turns, the new number of turns, after VMI, is 4.05. With average sales of \$900 million for the VMI vendors, the new inventory figure would be \$900 million / 4.05 = \$222 million (\$78 million in reduced inventory). There

was an increase of 3.5% in sales without an increase in inventory. This was possible only with a long-term partnership with suppliers who are now able to work with the customer on better selling categories, new promotions, and new items. It becomes essential for the supplier that the customer succeeds as well. The trend for DBI took approximately five years to develop. So the learning curve was five years.

The savings to Damaged and Obsolescence is 9.75% of inventory. Do it Best Corp. obtained the savings through VMI. Calculations show a 9.75% of $78 million, or $7.606 million, savings in Damaged and Obsolescence costs.

With the 400% increase in productivity and the 35% increase in turns, the calculations shown in the following section are now possible.

Lean and Green Savings of VMI Reduction of Inventory

- The Lean Savings of VMI Reduction of Inventory:
  - Starting Inventory is $300,000,000.
  - Starting Sales are $900,000,000.
  - Starting Turns are 3.00.
  - A 35% increase in turns, allowing an inventory reduction of $78,000,000.
  - The New Inventory using VMI is $300,000,000 – $78,000,000 = $222,000,000.
  - The new turns are 4.05.
  - Carrying cost of 26.66% savings yields a $20,720,000 reduction.
  - Freed-up cost of capital is .02 × $78,000,000 = $1,560,000.
- Total Lean Savings from VMI Reduction of Inventory is $22,280,000.
- The Green Savings of VMI Reduction of Inventory:
  - $490 saved in electricity usage for the Purchasing area.
  - $7.606 million per year in landfill savings.
- Total Lean and Green Savings for VMI Reduction of Inventory is $29,886,490.

The Green Savings is as shown here:

- A new warehouse (now unnecessary) would cost $14 million in inventory and $10 million in the building cost. The VMI initiative would save:
  - $3.517 million in additional infrastructure cost.
  - An additional 3 to 6.5 million with an average of 4.75 million in furnishing, equipment, racking, and automation equipment will not be needed.
  - This totals to $14 million in inventory dollars + $3.517 million + $4.75 million equals a total cost of $22,260,000.
- Without the existing improvement in technology, it would be necessary to increase the size of the warehouse by 35%. The increase would represent additional costs of 35% × $22,260,000 = $7.791 million.
- The added cost of utilities would be computed as $0.5717 a square foot annually. This is dependent on the amount of automated equipment in the warehouse. For a 450,000-square-foot warehouse the average is 450,000 × $0.57170 = $256,500 spent annually on electricity. Total savings in utility costs is .35 × $256,500 × 9 = $807,975.

The last three categories of savings are Green Savings. The savings are a 25% increase in SKU count with no increase in inventory space, a cost savings of $807,975 saved in electrical usage generation, and finally a sales increase of 3.5% without additional resource expenditures.

- The Lean Savings is the added sales = 1.035 × $900,000,000 = $931,000,000. This is a $31,000,000 increase in sales. With a profit margin of 18%, this represents an increase in profits of $5,580,000.
- The new turns are 931,000,000 / $222,000,000 = 4.19 turns.
- The Green Savings erases the need to spend an additional $7.791 million in added warehouse infrastructure costs to accommodate the 3.5% sales increase and the 25% addition in SKU count. This is considered Green Savings because raw materials for warehouse expansion are unnecessary.

- The added cost of utilities would be computed as $0.5717 a square foot annually. This is dependent on the amount of automated equipment in the warehouse. For a 450,000-square-foot warehouse, the average is 450,000 × $0.57170 = $256,500 spent annually on electricity.

The Total Lean for the three categories is the increased profits from an increase of 3.5% of sales = $5,580,000; company turns are 4.19, sales are $931 million, and inventory is $222 million.

The Total Green for the three categories is the decrease in infrastructure cost = $7,791,000; the decrease in utilities cost = $807,975; and the total Green Cost = $8,598,975.

The total savings for the entire VMI & EDI program including all the preceding steps is as shown here:

Lean Savings of $29,660,800 +
Green Savings of $16,205,465 =
Total Savings of $45,866,265

Certification Program and Scorecarding

The next area of concern is the vendor or supplier scorecard. This helps keep a dashboard view of the supplier and perhaps also the carrier's performance for eventual continuous improvement, or the Kaizen process. Development of a joint retailer/supplier scorecard is critical to success. Measurements include the following:

- Product profitability
- Inventory turns and service level
- Promotional effectiveness
- New product introduction effectiveness
- Quality/returned goods
- On-time performance

The operational issues of certification programs include these:

- Product frequency of arrival with receiving cost in mind
- Product delivery timing during the day
- Vendor minimum

- Item minimums
- Pallets
- Pallet layer stacking
- Frequency of arrivals
- Pallet or container type
- Label type to use
- Label placement
- RF collaboration with current system to make a more efficient information flow between the supplier and the distributor

Certification programs cut Do it Best Corp. lead times down by approximately one day. That one-day savings included a reduction in manufacturing lead time as well as receiving and stocking the product. Do it Best Corp. found that the certification program equates to an additional 2.2% reduction of inventory for each day saved in lead time. Therefore, the savings for the certification program is 2.2% × $222 million in inventory. This is approximately $5 million in inventory reduction, making the new inventory level $217 million.

Do it Best Corp. also mandated the use of specific labels, pallet sizes, and label placement to maximize productivity. Logistics labels are increasingly used to track containers and other logistics units through the supply chain, as recording and monitoring the movement of goods is an essential part of supply chain management. This allows the employees to scan each container or large box and know how many items are inside. These are the most successful mandates:

SCC-14 (Shipping Container Code) is a 14-digit number assigned to fixed-content shipping containers. Using the SCC-14, it is assumed that like items are in each box. When the box is scanned, the count is given without opening the container for counts. For example, the UPC number tells the system that the box holds 12 units.

SCC-18 (the Serial Shipping Container Code) is a unique serial number that is used to identify each individual pallet, assuming that various assorted products are on a pallet. Scanning the pallet gives the items contained on it. The pallet can be moved to the stocking location without the shrink-wrap being broken at this time. Employees can scan more products per hour and move products from receiving to stocking at a much faster rate.

Another part of the certification program is the use of the "funnel" program. Do it Best Corp. asked the supplier to stock like items on each pallet. This means that a pallet may have multiple purchase order numbers from multiple orders for the same item. Using the old system, manufacturers filled their orders by purchase order and any back orders were filled and palletized by PO. Having like items spread across multiple pallets hurts productivity. Do it Best Corp. also requires suppliers to have bin location numbers on their files. The suppliers place stock merchandise in the pallets with the same inventory location.

The largest part of receiving is the breakdown and sorting of product. This accounts for as much as 80% of the time spent in receiving. The bottleneck is eliminated by having the pallets go directly to the stocking location without any breakdown or sorting.

Certification Program Savings

- The Lean Savings of the Certification Program
  - Carrying cost savings \$5,000,000 inventory × 26.6% = \$1,330,000
  - Freed-up cost of capital is .02 × \$5,000,000 inventory savings = \$100,000.
- The Green Savings of the Certification Program
  - 9.75% for Damage and Obsolescence × \$5,000,000 = \$487,500 per year in landfill savings.
- Total Lean and Green Savings so far is \$1,917,500.

To this point, after the Certification Program:

- Company turns are 4.25.
- Sales are \$922 million.
- Inventory now is \$217 million.

References

(1) http://www.urenio.org/tools/en/supply_chain_management.pdf.

Index

Symbols

3PL (third-party logistics), 137
- benefits of, 142-143
- Green Savings, 144-145
- Lean Savings, 143-144
- multimodal, 138
- network optimization, 139-142
- OSS (onsite supplier), 138-139

A

ABC analysis, 147-148

ABCDE classification of inventory, 147-149
- central stocking, 152-157
  - *Green Savings, 157*
  - *Lean Savings, 157*
- Green Savings, 150
- Lean Savings, 149-150
- substitution program, 150-151
  - *Green Savings, 152*
  - *Lean Savings, 151-152*

accounting controls, benefits of ERP (Enterprise Resource Programs), 130-131

adaptive forecasting, 347

Advance Ship Notice (ASN), 15, 19
- EDI savings, 20-22
- TMS (Transportation Management System), 90

advanced order fulfillment system technologies, batch order summary sheets, 219-222

advanced planning, forecast programs, 348

affinity analysis, staff training, 5

Algebraic Model, 276-278

American Production and Inventory Control Society (APICS), 199

Analysis activity, CPFR (Collaborative Planning, Forecasting, and Replenishment), 207-210

analytics features, ERP (Enterprise Resource Programs), 124-125

Analyze phase, Six Sigma, 390
- Behavioral Health Hospital, 398-400

animal industry, RFID (Radio Frequency Identity Tags), 54

APICS (American Production and Inventory Control Society), 199

apparel industry, RFID (Radio Frequency Identity Tags), 52-54

Apple, 4
- iMac, 4

ASN. *See* Advance Ship Notice (ASN)

AS/RS (Automatic Storage and Retrieval Equipment), 215

Asset Life Cycle Management, RFID (Radio Frequency Identity Tags), 57

ATP (available to promise), 122-124

auto industry, RFID (Radio Frequency Identity Tags), 55
automated forecast system, TMS (Transportation Management System), 83-90
automatic re-initialization, forecast programs, 347
automation, distribution portal, 107
automation savings, EDI (VMI), 19-20
Autonomic Supply Chain Management, 59
available to promise (ATP), 122-124
Average Inventory, 162-163

B

B2B (business-to-business), 97
customer portals, 101
competition's sales choices, 102-103
lift by category, 101-102
lift by item, 102
lift by month, 102
Merchandising Optimizer, 103
operational savings, 106-107
price optimizer, 102
productivity enhancements, 103-104
savings, 104-105
variable pricing, 102
distribution portal, 107
automation, 107
iPad used in distribution setting, 107-108
IT green savings, 109
savings of new items using new item portals, 108
green IT
energy efficiency, 110-115
energy usage, 109-110
greenhouse gas emissions, 110
vendor portals
automation of Show Market Bulletins, 98-99
closeout and discontinued items, 100-101
new items portal, 100
new items portal, savings, 100
special events, 101
special prices, 101
back order time to completion, WMS (Warehouse Management System), 33
back-haul, visual supply chain, 240
batch order picking, 217
batch order summary sheets, 217-218
advanced order fulfillment system technologies, 219-222
mechanized takeaways, 218-219
order fulfillment systems, 222-224
BD&L (broken, damaged, and lost inventory), 64
Behavioral Health Hospital
Six Sigma, 390-391
Analyze phase, 398-400
Control phase, 405
Define phase, 391-395
Improve phase, 401-404
Measure phase, 395-397
benefits of ERP (Enterprise Resource Programs)
improved accounting controls, 130-131
improved customer service, 130
inventory reduction, 129
labor cost reductions, 130

BI (Business Intelligence). *See* Business Intelligence
blade servers, 114
Borders, 109
broken, damaged, and lost inventory (BD&L), 64
building flushing, Sweetwater, 387
building site, 383
bullwhip effect, 12, 57
Business Intelligence,7
  SharePoint, 115
business processes, ERP (Enterprise Resource Programs), 124-125
business-to-business. *See* B2B (business-to-business)

C

calculated vendor lead time, WMS (Warehouse Management System), 33
calculating
  carbon dioxide emission, 116
  enterprise dollar cost of electrical utilities, 118
  grams of carbon dioxide used, 119
  number of kilowatt-hours used, 118
  pounds of carbon dioxide emitted per year, 116-117
cannibalization of gross margins, 160
carbon dioxide emission, 81, 90, 369-373
  calculating, 116
  calculating pounds emitted per year, 116-117
carbon dioxide emissions, calculating grams used, 119
central stocking, ABCDE classification of inventory, 152-157
  Green Savings, 157
  Lean Savings, 157
certification programs, 12, 24-26
  savings, 26
certified wood, Sweetwater, 386-387
chain of custody, pharmaceutical industry, 56
Change Management, 6
characteristics of forecast programs, 345-351
check digits, 252
closeout items, vendor portals, 100-101
Collaborative Planning, Forecasting, and Replenishment. *See* CPFR (Collaborative Planning, Forecasting, and Replenishment)
Collaborative Transportation Management, CPFR (Collaborative Planning, Forecasting, and Replenishment), 212-213
commissioning of mechanical systems, Sweetwater, 387
Commodities Catalog Savings, customer portals, 105
communities for portals, SharePoint,115
competition's sales choices, customer portals, 102-103
components of RFID (Radio Frequency Identity Tags), 50
composites for business processes, SharePoint, 115
computing cost of electricity, 116
consigning, inventory, 11
consolidation-points network, visual supply chain, 240
construction-waste management, Sweetwater, 386
Container Delivery Management, 166
contentment for content management, SharePoint, 115

Control phase, Six Sigma, 390
Behavioral Health Hospital, 405
Corporate Construction, 384
correlation analysis, forecast programs, 348
cost of electricity, computing, 116
cost of implementing RFID (Radio Frequency Identity Tags), 49-50
cost of RFID implementation, distribution industry case study, 69-71
cost of utilities, calculating pounds of carbon dioxide emitted per year, 116-117
CPFR (Collaborative Planning, Forecasting, and Replenishment), 123, 199-202
Analysis activity, 207-210
CTM (Collaborative Transportation Management), 212-213
Demand and Supply Management activity, 203-206
Execution activity, 206-207
Green Savings, 211-212
Lean Savings, 210-211
Strategic Planning activity, 202-203
CRM features, ERP (Enterprise Resource Programs), 125-126
cross docking, WMS (Warehouse Management System), 30
CTM (Collaborative Transportation Management), CPFR (Collaborative Planning, Forecasting, and Replenishment), 212-213
customer portals, 101
Commodities Catalog Savings, 105
competition's sales choices, 102-103
lift by category, 101-102
lift by item, 102
lift by month, 102
Merchandising Optimizer, 103
New Product Merchandising Portal, 105
operational savings, 106-107
price optimizer, 102
productivity enhancements, 103-104
savings, 104-105
variable pricing, 102
customer service, benefits of ERP (Enterprise Resource Programs), 130

D

Daily Sales Product Activity Data 852, 17
DAM (Digital Asset Management), 256
Darwin, Charles, 4
data mining, 216
data pools, item synchronization, 247
data synchronization, item synchronization, 248-249
data warehouse, 98
daylight, Sweetwater, 385
DBLV (distribution by line value), 149
dead run, visual supply chain, 240
Define phase, Six Sigma, 390
Behavioral Health Hospital, 391-395
Demand and Supply Management activity, CPFR (Collaborative Planning, Forecasting, and Replenishment), 203-206
Demand Filter (DF), 298
demand patterns, 348
demographic information, 161
designing paperless environments with software, internal supply chains, 255-258

DF (Demand Filter), 298, 344
Digital Asset Management (DAM), 256
Digital Manufacturing, 245
directed putaway, RF (Radio Frequency), WMS (Warehouse Management System), 45
discontinued items, 206
vendor portals, 100-101
dispersion measurement, gamma smoothing, TI, 314-316
dispersion of demand, 297-300
distribution industry case study, RFID (Radio Frequency Identity Tags), 63-70
cost structure of RFID implementation, 69-71
future recommendations, 74-75
implementing RFID, 68-70
ROI (return on investment), 70
savings, 73-74
distribution portal, 107
automation, 107
iPad used in distribution setting, 107-108
IT green savings, 109
new items portal, 108
savings of new items using new item portals, 108
distribution requirements planning. *See* DRP (distribution requirements planning)
Distribution Resource Management (DRM), 165-168
DM (Document Management), 256
Do it Best Corp, 12
certification programs, 25
savings, 22
SharePoint, 97
Document Management (DM), 256
documents, VMI partner document, 12
dollar fill rate, WMS (Warehouse Management System), 32
DRM (Distribution Resource Management), 165-168
DRP (distribution requirements planning), 166, 168
freight forwarder program, savings, 172
Green Savings, 169, 171
landfill savings, 170
service-level savings, 170
utility costs, 170
Lean Savings, 168-169, 171-172
dynamic routing, visual supply chain, 240

E

EAN.UCC, 250
ECM (Enterprise Content Management), 256
economic order formula
new, 361-364
old, 354-360
Economic Order Quantity. *See* EOQ (Economic Order Quantity)
economical routing, TMS (Transportation Management System), 80
ECR (Efficient Consumer Response), 246
EDI (electronic data interchange)
automation savings (VMI), 19-20
savings, 14-17
Advance Ship Notice, 20-22
invoices, 20-22
PO (purchase order), 20-22

transaction sets, 14-17
summary, 18
Efficient Consumer Response (ECR), 246
efficient servers, 111
electricity, average amount of grams of electricity generated in U.S. for one kWh, 117
electronic data interchange. *See* EDI (electronic data interchange)
Electronic Product Code (EPC), 51
Ellis, Liz, 384
Embry Riddle, Oracle Content Management, 264-265
Emerson Process, Oracle Content Management, 267
employee retention, 5
employees, incentives, 6
energy efficiency, 383
green IT, 110-115
energy usage, green IT, 109-110
Enterprise Content Management (ECM), 256
enterprise dollar, calculating cost of electrical utilities, 118
enterprise portals, 123
Enterprise Resource Programs. *See* ERP (Enterprise Resource Programs)
environmental facts, internal supply chains, 255
Environmental Paper Network, 255
EOQ (Economic Order Quantity), 1, 353-354
determining economical quantity to order, 359
forecast programs, 347
formulas, 355-356
Green effect, 366
transportation costs, 360
EPC (Electronic Product Code), 51, 246
ERP (Enterprise Resource Programs), 121-122
benefits of
improved accounting controls, 130-131
improved customer service, 130
inventory reduction, 129
labor cost reductions, 130
business processes and analytics features that can be added, 124-125
CRM features, 125-126
financials features, 126
human resource management features, 127
manufacturing features, 127
Procter & Gamble KPIs Excel spreadsheet, 135
recycle, disposal, and hazardous metrics of green, 134
SCM (Supply Chain Management) features, 128-129
sustainable drive to green, 131-133
transportation metrics of green, 134
utilities metrics of green, 134
ERP environment, 7
ERP II (Enterprise Resource Management), 9
error measurements, 342-344
VI (Volatility Index), 342-343
ESO (Expected Stock Outs), 174
event driven, 55
execution, 7
technology, 7-8
Execution activity, CPFR (Collaborative Planning, Forecasting, and Replenishment), 206-207

expediting systems, 349
exponential smoothing, 284-287
versus gamma smoothing, 308-310
Horizontal Model, 287-288
inventory control metrics, VI (Volatility Index) = .08187, 320-321
MAD (mean absolute deviation), 294-297
Seasonal Model, 289-293
Trend Model, 288-290
Trend Seasonal Model, 294
VI (Volatility Index) = 1.0, 329-330
VI (Volatility Index) = .20, inventory control metrics, 323-324
VI (Volatility Index) = .50, 326-327
Exponential Smoothing Models, 280-281
benchmarks, 322
exponential smoothing order quantity, graphs, 338-340

F

fans, variable-speed fans, 111-112
fill rate, 148
financials features, ERP (Enterprise Resource Programs), 126
finding forecast models, 300
fixed order quantities, 349
Fixed Period Model. *See* FP (Fixed Period Model)
Fixed Quantity Model, 179, 185-190
forecast models, finding, 300
Forecast Planning Schedule 830, 17
forecast programs
adaptive forecasting, 347
advanced planning, 348
automatic reinitialization, 347
characteristics of, 345-351
correlation analysis, 348
EOQ (Economic Order Quantity), 347
intervals, 348
joint order system process, 351
management information systems, 351
open-to-buy system, 349
regression analysis, 347
seasonal indexing, 350-351
seasonal profiles, 350
service-level metrics, 345-346
Forecasting and Ordering Using Regression Time Series and Econometrics, 8
forecasting procedures, 1
forecasting systems
Algebraic Model, 276-278
dispersion of demand, 297-300
exponential smoothing, 284-287
Horizontal Model, 287-288
Seasonal Model, 289-293
Trend Model, 288-290
Trend Seasonal Model, 294
gamma smoothing, 305
Horizontal Exponential Smoothing Model, 301
Logarithmic Models, 282-285
Logistics Model, 281
Regression Models, 278-280
Seasonal Exponential Smoothing Model, 303
seasonal profile forecasting, 346
Trend Exponential Smoothing Model, 302-303
Trigonometric Models, 280-281
forecasting VMI (vendor-managed inventory), 9-12

formulas
EOQ (Economic Order Quantity), 355-356
gamma smoothing, 305-308
FOURTE (Forecasting and Ordering Using Regression Time Series and Econometrics), 8
FP (Fixed Period Model), 179-185
ordering strategy, 181
variable demand, 183
FQ (Fixed Quantity Model), 179, 185-190
freight, scheduling, 346
freight forwarder program, DRP (distribution requirements planning), savings, 172
funnel program, 26

G

gaming industry, RFID (Radio Frequency Identity Tags), 58
gamma smoothing, 285, 305
examples, 311-312
versus exponential smoothing, 308-310
inventory control metrics, VI (Volatility Index) = .08187, 321-322
theory and formulas, 305-308
TI, 312-313
dispersion measurement, 314-316
effects of increasing VI, 316-318
inventory control metrics, 319-320
VI (Volatility Index) = 1.0, 330-333
VI (Volatility Index) = .20, 324-326
VI (Volatility Index) = .50, 327-329
Gamma Smoothing Model, benchmarks, 322
GDS (Global Data Synchronization), 246
glass, Sweetwater, 384
Global Data Synchronization, 246
global temperatures, 373
GMROI (Gross Margin Return on Investment), 2
Go Green with Oracle Content Management, 261-272
gravity flow roller system, 67-68
green
recycle, disposal, and hazardous metrics, ERP (Enterprise Resource Programs), 134
transportation metrics, ERP (Enterprise Resource Programs), 134
utilities metrics, ERP (Enterprise Resource Programs), 134
Green effect, EOQ (Economic Order Quantity), 366
green IT
energy efficiency, 110-115
energy usage, 109-110
greenhouse gas emissions, 110
Green savings
3PL (third-party logistics), 144-145
ABCDE classification of inventory, 150
central stocking, 157
CPFR (Collaborative Planning, Forecasting, and Replenishment), 211-212
customer portals, 105
distribution portal, 109
DRP (distribution requirements planning), 169, 171
landfill savings, 170
service-level savings, 170
utility costs, 170

EDI (Advance Ship Notice, POs and invoices), 20-22
ERP (Enterprise Resource Programs), accounting controls, 131
Joint Order Allocation, 177
paper, 260
RF (Radio Frequency), WMS (Warehouse Management System), 47
substitution program, 152
TMS (Transportation Management System), 80-83
VMI Reduction of Inventory, 23-24
VPQ (Variable Period and Quantity Model), 198
WMS (Warehouse Management System), 38
green supply chain management, 376-378
Green Supply Chains, 376
Green value, TMS (Transportation Management System), 78-79
Green variable, supply chains, 10
greenhouse gas emissions, green IT, 110
Gross Margin Return on Investment, 2
GS1 (Global Standard 1), 247
GTIN numbers
data structures, 252-253
master data alignment, 250-251

H

hardware location, 113-114
Henry, Tom, 384
Horizontal Exponential Smoothing Model, 301
Horizontal Model, exponential smoothing, 287-288
hub-and-spoke arrangement, visual supply chain, 239
human resource management features, ERP (Enterprise Resource Programs), 127
HVAC (Heating, Ventilation, and Air Conditioning), 11

I

ice storage, Sweetwater, 387
ICT (information and communication technologies), 110
iMac, 4
implementing RFID (Radio Frequency Identity Tags), distribution industry case study, 68-70
Improve phase, Six Sigma, 390
Behavioral Health Hospital, 401-404
Improved Warehouse Worker Productivity, WMS (Warehouse Management System), 34-35
improving
Inventory Management, WMS (Warehouse Management System), 34
Transportation Performance, WMS (Warehouse Management System), 35-37
inbound freight, scheduling, 346
incentives, employees, 6
indirect cost savings, distribution industry case study, RFID (Radio Frequency Identity Tags), 74
individual item lead time, WMS (Warehouse Management System), 33
Industrial Revolution, consequences of, 369-373

information and communication technologies (ICT), 110
initialization, 300
Innovation Management, 4-5
installing RF systems, 224-225
insulation, Sweetwater, 385
Intergovernmental Panel on Climate Change (IPCC), 116
internal supply chains
designing paperless environments with software, 255-258
environmental facts, 255
Mobius software, 258-259
saving paper, 259
Green Savings, 260
Lean Savings, 259-260
intervals, forecast programs, 348
inventory
Average Inventory, 162-163
consigning, 11
visual supply chain, 242
inventory control metrics
gamma smoothing, TI, 319-320
VI (Volatility Index) = .08187
exponential smoothing, 320-321
gamma smoothing, 321-322
VI (Volatility Index) = 1.0
exponential smoothing, 329-330
gamma smoothing, 330-333
VI (Volatility Index) = .20
exponential smoothing, 323-324
gamma smoothing, 324-326
VI (Volatility Index) = .50
exponential smoothing, 326-327
gamma smoothing, 327-329
inventory knowledge, 64
inventory management, 147
improving, 34
WMS (Warehouse Management System), 29
inventory reduction, benefits of ERP (Enterprise Resource Programs), 129
invoices, 15
EDI savings, 20-22
iPad, distribution portal, 107-108
IPCC (Intergovernmental Panel on Climate Change), 116
ISO (International Organization for Standardization), 133
IT Green Initiative, 110-115
IT green savings, distribution portal, 109
IT resources, sharing, 112
IT system redundancies, 112
item data accuracy, master data alignment, 245-246
Item Maintenance Transaction Set 888, 17
item synchronization, 247, 252-253
data pools, 247
data synchronization, 248-249
Items Price/Sales Catalog 832, 17

J

JIT (just-in-time), 10, 245, 354
Jobs, Steve, 4, 7
Joint Order Allocation, 173-176
Green Savings, 177
Lean Savings, 177
joint order system process, forecast programs, 351
just-in-time (JIT), 10, 245, 354

K

k factor, priority, 343
Keeling, C. David, 372
kilowatt-hours used, calculating, 118
knowledge management, 6-7

L

labor cost reductions, benefits of ERP (Enterprise Resource Programs), 130
landfill savings, DRP (distribution requirements planning), 170
lead times, 349
Leadership in Energy and Environmental Design. *See* LEED (Leadership in Energy and Environmental Design)
Leadership in Energy and Environmental Design (LEED) Platinum Certification, Sweetwater, 384
Lean Green Supply Chain, 1
Lean Savings
  3PL (third-party logistics), 143-144
  ABCDE classification of inventory, 149-150
  central stocking, 157
  CPFR (Collaborative Planning, Forecasting, and Replenishment), 210-211
  customer portals, 104-105
  DRP (distribution requirements planning), 168-169, 171-172
  EDI (Advance Ship Notice, POs, and invoices), 20-22
  ERP (Enterprise Resource Programs), accounting controls, 131
  Joint Order Allocation, 177
  paper, 259-260
  promotional forecast system, 163-164
  RF (Radio Frequency), WMS (Warehouse Management System), 46
  substitution program, 151-152
  TMS (Transportation Management System), 93
  VMI Reduction of Inventory, 22
VPQ (Variable Period and Quantity Model), 197-198
WMS (Warehouse Management System), 37-38
Lean Six Sigma, 389
LEED (Leadership in Energy and Environmental Design), 375-376, 378-379
  development, 379
LEED Certification, 380-381
LEED Green Building Rating System, 380
licensing software, TMS (Transportation Management System), 77-78
lift by category, customer portals, 101-102
lift by item, customer portals, 102
lift by month, customer portals, 102
light sensors, Sweetwater, 385
line accuracy, WMS (Warehouse Management System), 32
line fill rate, WMS (Warehouse Management System), 31
Logarithmic Models, 282-285
logistics industry, RFID (Radio Frequency Identity Tags), 56
Logistics Model, 281
low-emitting materials, Sweetwater, 387

Lowes, 11
LT (lead time), 180
FQ (Fixed Quantity Model), 186

M

MAD (mean absolute deviation), 280-281
exponential smoothing, 294-297
tracking signal, 298
manage stock, WMS (Warehouse Management System), 30
manage storage facilities, WMS (Warehouse Management System), 30
management information systems, forecast programs, 351
Managing by Walking Around, 6, 35
manual orders, TMS (Transportation Management System), 83
manufacturing, RFID (Radio Frequency Identity Tags), 58
manufacturing features, ERP (Enterprise Resource Programs), 127
master data alignment, 245
GTIN numbers, 250-251
item data accuracy, 245-246
material efficiency, 383
material handling, 215
material management, 122
Material Requirement Programs, 161-162
Material Safety Data Sheet (MSDS), 16
Mauna Loa CO_2, 371-372
mean absolute deviation (MAD), 280-281
Measure phase, Six Sigma, 390
Behavioral Health Hospital, 395-397
mechanized takeaways, batch order summary sheets, 218-219
medical environment case studies, RFID (Radio Frequency Identity Tags), 60-62
ROI, 62-63
savings estimates, 62
Merchandising Optimizer, customer portals, 103
metrics, WMS (Warehouse Management System), 31-33
Microsoft SharePoint, 97, 114-115
platform of services, 115
minimizing out-of-stocks, 150-151
Min/Max strategy, 350
Missouri Division of Processional Registration, Oracle Content Management, 268
Mobile Supply Chain, ERP (Enterprise Resource Programs), 124
Mobius software, 258-259
saving paper, 259-260
MRP II (networked closed-loop manufacturing requirement planning), 9
MSDS (Material Safety Data Sheet), 16
MSKTD Associates, 384
Mulally, Allen, 7

N

ND (neighborhood development), 381
network optimization, third-party providers, 139-142
new items portal, 100
distribution portal, 108
savings, 100

New Product Merchandising Portal, customer portals, 105
number of back orders, WMS (Warehouse Management System), 33

O

occupant health and safety, 383
OI (Outliner Indicator), 343-344
On Device, 8
On Order Report, 106
on-demand, 7
on-device computing, ERP (Enterprise Resource Programs), 124
on-off power cycler devices, 112
on-order (OO), 181
onsite supplier (OSS), 10
onsite suppliers (OSS), third-party providers, 138-139
on-time delivery, WMS (Warehouse Management System), 33
open-to-buy system, forecast programs, 349
operational savings, customer portals, 106-107
Opportunity Management, 55
OQ, 181
Oracle Content Management, 217
  "Go Green with Oracle Content Management," 261-272
order accuracy, WMS (Warehouse Management System), 32
order fill rate, WMS (Warehouse Management System), 31
order filling, RF (Radio Frequency), WMS (Warehouse Management System), 45-46
order fulfillment systems, batch order summary sheets, 222-224
order fulfillment technologies, 219-222
Order Fulfillment, WMS (Warehouse Management System), 29
order picking, 216
  batch order picking, 217
  WMS (Warehouse Management System), 36
order processing, WMS (Warehouse Management System), 31
order stocking, RF (WMS), 45
ordering strategy, FP (Fixed Period Model), 181
orders cycle time, WMS (Warehouse Management System), 32
order-to-cash cycle, CPFR (Collaborative Planning, Forecasting, and Replenishment), 206-207
Organizational Structure 210, 17
Organizational Structure 816, 16
OSHA (Occupational Safety and Health Administration), 16
OSS (onsite supplier), 10, 138-139
outdoor air delivery monitoring, Sweetwater, 388
out-of-stocks, minimizing, 150-151

P

packaging levels, UCC-12, 251
paper, 255
  saving, 259
    Green Savings, 260
    Lean Savings, 259-260
Pareto charts, 397-394
Payment Order/Remittance Advice, 16

peddle run, visual supply chain, 240
pedigree tracking, pharmaceutical industry, 55
Pick to Light, 227-229
  mechanics of, 229
plan-o-grams, 107
platform of services, SharePoint, 115
PLM (Product Life Cycle Management), 245
PMA (predetermined maximum available), 181
PO (purchase order), 14, 19-20
  EDI savings, 20-22
Point of Sale Data Report, 106
postponement, WMS (Warehouse Management System), 31
power supplies, 113
Price Information 879, 16-17
price optimizer, customer portals, 102
Price/Sales Catalog, 16
priority, k factor, 343
Procter & Gamble KPIs Excel spreadsheet, ERP (Enterprise Resource Programs), 135
Product Life Cycle Management (PLM), 245
productivity enhancements, customer portals, 103-104
productivity metrics, Voice Pick, 233-237
profit-sharing program, Talent Management, 5
Promotion to Regular Usage (PRU), 160
Promotion to Stock Demand (PSD), 160
promotional forecast system, 159-163
  Lean Savings, 163-164
promotional lift, 159
promotional use file, 161
provide connectivity to the enterprise, WMS (Warehouse Management System), 30
PRU (Promotion to Regular Usage), 160
PSD (Promotion to Stock Demand), 160
PUE (power usage effectiveness), 110
purchase orders. *See* PO (purchase order)

R

rack servers, 111
Radio Frequency. *See* RF (Radio Frequency)
Radio Frequency Identity Tags. *See* RFID (Radio Frequency Identity Tags)
Real Time Location Systems, 52
receive stock and returns/reverse logistics, WMS (Warehouse Management System), 30
Receiving Advice 861, 17
receiving processes, 225-226
  Pick to Light, 227-229
  RF picking system metrics, 227
  RF productivity, 226
  Voice Pick, 230-233
recycle, disposal, and hazardous metrics of green (ERP), 134
recycled content of materials, Sweetwater, 386
recycling, Sweetwater, 385
regional materials, Sweetwater, 386
regression analysis, forecast programs, 347
Regression Models, 278-280
renewable materials, Sweetwater, 384

replenishment policies, RFID (Radio Frequency Identity Tags), 57
resource management, creating world-class companies, 3-9
retaining employees, 5
RF (Radio Frequency), WMS (Warehouse Management System), 38-40
applied analysis, 43-46
directed putaway, 45
Green Savings, 47
improvements, 46
Lean Savings, 46
order filling, 45-46
order stocking, 45
RF picking system metrics, receiving processes, 227
RF productivity
receiving processes, 226
stocking processes, 226
RF systems, installing, 224-225
RFID (Radio Frequency Identity Tags), 49
advantages of, 51
animal industry, 54
apparel industry, 52-54
Asset Life Cycle Management, 57
auto industry, 55
Autonomic Supply Chain Management, 59
bullwhip effect, 57
categories of real-time information, 51
components of, 50
cost of implementing, 49-50
distribution industry case study, 63-70
cost structure of RFID implementation, 69-71
future recommendations, 74-75
implementing RFID, 68-70
ROI (return on investment), 70
savings, 73-74
gaming industry, 58
growth of, 52
healthcare and pharmaceutical industry, 55-56
how it works, 50
implementing, distribution industry case study, 68-70
Jewelry Management Industry, 58
logistics industry, 56
manufacturing, 58
medical environment case studies, 60-62
ROI, 62-63
savings estimates, 62
replenishment policies, 57
Supply Chain Management (SCM), 57
WMS (Warehouse Management System), 56
RFID antennas and cabling, 50
RFID middleware, 50
RFID printer, 50
RFID reader, 50
RFID tags, 50
ROI (return on investment)
distribution industry case study, RFID (Radio Frequency Identity Tags), 70
medical environment case studies, RFID (Radio Frequency Identity Tags), 62-63
roof membrane, Sweetwater, 385
RTLS (Real Time Location Systems), 52

S

SAAS (Software as a Service), 7

safety stock (SS), 181

SAP, 133

savings

certification programs, 26

customer portals, 104-105

distribution industry case study, RFID (Radio Frequency Identity Tags), 73-74

EDI, 14-17

Advance Ship Notice, 20-22

invoices, 20-22

PO (purchase order), 20-22

freight forwarder program, 172

medical environment case studies, RFID (Radio Frequency Identity Tags), 62

new items portal, 100

TMS (Transportation Management System), 94-95

WMS (Warehouse Management System), 37-38

scalability and configurability, WMS (Warehouse Management System), 29

scan based trading programs, 16-17

SCE (Supply Chain Execution), 27

scheduling inbound freight, 346

SCM (Supply Chain Management), 27, 215

SCM (Supply Chain Management) features, ERP (Enterprise Resource Programs), 128-129

scorecarding, 24

SCP (Supply Chain Planning), 27

search for more productivity, SharePoint, 115

Seasonal Exponential Smoothing Model, 303, 333-338

Seasonal Gamma Smoothing, 333-338, 340-342

seasonal indexing, forecast programs, 350-351

Seasonal Model, exponential smoothing, 289-293

seasonal profile forecasting, 346

seasonal profiles, forecast programs, 350

servers

blade servers, 114

efficient servers, 111

rack servers, 111

service-level factor, 357

service-level metrics, 345-346

service-level savings, DRP (distribution requirements planning), 170

SharePoint, 97, 114-115

platform of services, 115

sharing IT resources, 112

Shaw Industries, 378

shelf life, 348

shelf life monitoring, WMS (Warehouse Management System), 29

Show Market Bulletins, automation, from vendor portals, 98-99

SIMS, 60

sites for collaboration, SharePoint, 115

Six Sigma, 389-390

Behavioral Health Hospital, 390-391

Analyze phase, 398-400

Control phase, 405

Define phase, 391-395

Improve phase, 401-404

Measure phase, 395-397

SKU, 154
software, licensing, TMS (Transportation Management System), 77-78
SOP (standard operating procedures), 12
sourcing visual supply chain, 242
special events, vendor portals, 101
special prices, vendor portals, 101
SSO (Specified Service Overall), 174
staff training, affinity analysis, 5
Standard Forwarding Company, Oracle Content Management, 266-267
standard operating procedures (SOP), 12
stock status, 180
stocking processes, 225-226
Pick to Light, 227-229
RF picking system metrics, 227
RF productivity, 226
Voice Pick, 230-233
storage devices, 112-113
Strategic Planning activity, CPFR (Collaborative Planning, Forecasting, and Replenishment), 202-203
substitution program, ABCDE classification of inventory, 150-151
Green Savings, 152
Supply Chain Execution (SCE), 27
Supply Chain Management (SCM), 27
RFID (Radio Frequency Identity Tags), 57
Supply Chain Planning (SCP), 27
supply chains, 2-14
Green variable, 10
Surack, Chuck, 384
sustainability, 3
sustainable drive to green, ERP (Enterprise Resource Programs), 131-133
Swedish Medical, Oracle Content Management, 265-266
Sweetwater, 383-384
building flushing, 387
certified wood, 386-387
commissioning of mechanical systems, 387
construction-waste management, 386
daylight, 385
glass, 384
ice storage, 387
insulation, 385
Leadership in Energy and Environmental Design (LEED) Platinum Certification, 384
light sensors, 385
low-emitting materials, 387
outdoor air delivery monitoring, 388
recycled content of materials, 386
recycling, 385
regional materials, 386
renewable materials, 384
roof membrane, 385
tobacco smoke control, 388
water use reduction, 386
system integration, WMS (Warehouse Management System), 28

T

Talent Management, 5
profit-sharing program, 5
technological advancements, 6-7
technology, execution, 7-8
theories, gamma smoothing, 305-308

third-party providers, 137
multimodal, 138
network optimization, 139-142
onsite suppliers (OSS), 138-139
TI, gamma smoothing, 312-313
dispersion measurement, 314-316
effects of increasing VI, 316-318
inventory control metrics, 319-320
TMS (Transportation Management System), 28, 77
ASN (Advance Ship Notice), 90
automated forecast system, 83-90
benefits of, 79-80
economical routing, 80
Green Savings, 80-83, 94
Green value, 78-79
Lean Savings, 93
licensing software, 77-78
manual orders, 83
savings, 94-95
vendors, 78
visibility, 79
tobacco smoke control, Sweetwater, 388
trace and track, pharmaceutical industry, 56
Track and Trace, 166
tracking material flow, WMS (Warehouse Management System), 31
tracking signal, MAD (mean absolute deviation), 298
transaction sets, EDI, 14-17
summary, 18
Transportation Carrier Shipment Status Message, 15
transportation costs, EOQ (Economic Order Quantity), 360
Transportation Management System. *See* TMS (Transportation Management System)
transportation metrics of green, ERP (Enterprise Resource Programs), 134
transportation performance, WMS (Warehouse Management System), 29
improving, 35-37
transportation policies, visual supply chain, 242
Trend Exponential Smoothing Model, 302-303
Trend Model, exponential smoothing, 288-290
Trend Seasonal Model, exponential smoothing, 294
Trigonometric Models, 280-281
TS (tracking signal indicator), 344

U

UCC-12, packaging levels, 251
UCCnet, 247
utilities, calculating enterprise dollar cost of, 118
utilities metrics of green, ERP (Enterprise Resource Programs), 134
utility costs, DRP (distribution requirements planning), 170

V

Value Stream Mapping, 36
variable demand, FP (Fixed Period Model), 183
Variable Period and Quantity Model. *See* VPQ (Variable Period and Quantity Model)

variable pricing, customer portals, 102
variable-speed fans, 111-112
vendor lead time, WMS (Warehouse Management System), 33
vendor minimum, 174
vendor portals, B2B (business-to-business)
automation of Show Market Bulletins, 98-99
closeout and discontinued items, 100-101
new items portal, 100
new items portal, savings, 100
special events, 101
special prices, 101
vendor-management inventory, 9-12
vendors, TMS (Transportation Management System), 78
VI (Volatility Index), 153, 312
effects of increasing VI, gamma smoothing, 316-318
error measurements, 342-343
VI (Volatility Index) = .08187, inventory control metrics
exponential smoothing, 320-321
gamma smoothing, 321-322
VI (Volatility Index) = 1.0, inventory control metrics
exponential smoothing, 329-330
gamma smoothing, 330-333
VI (Volatility Index) = .20, inventory control metrics
exponential smoothing, 323-324
gamma smoothing, 324-326
VI (Volatility Index) = .50, inventory control metrics
exponential smoothing, 326-327
gamma smoothing, 327-329
VICS (Voluntary Interindustry Commerce Solutions Association), 42-43, 199
virtualization, 114
visibility, TMS (Transportation Management System), 79
visible supply chain, 239, 242-244
visual supply chain, 239-242
back-haul, 240
consolidation-points network, 240
dead run, 240
dynamic routing, 240
hub-and-spoke arrangement, 239
inventory, 242
peddle run, 240
sourcing, 242
transportation policies, 242
VMI (vendor-managed inventory), 9-12
VMI, EDI automation savings, 19-20
VMI partner document, 12
VMI productivity increase, 18
VMI reduction of inventory
Green Savings, 23-24
Leans Savings, 22
Voice Pick, 230-233
productivity metrics, 233-237
Voluntary Interindustry Commerce Solutions Association, 42-43, 199
VPQ (Variable Period and Quantity Model), 179, 190-197
Green Savings, 198
Lean Savings, 197-198
VSM (Value Stream Mapping), 36

W

Warehouse Management System. *See* WMS (Warehouse Management System)

Warehouse Productivity, WMS (Warehouse Management System), 29
water efficiency, 383
water use reduction, Sweetwater, 386
web-based platform, WMS (Warehouse Management System), 29
WebEDI (web-based EDI), 14-17
WMS (Warehouse Management System), 27-28
cross docking, 30
functionality of, 28-31
Green Savings, 38
improved warehouse worker productivity, 34-35
inventory management, improving, 34
Lean Savings, 37-38
Managing by Walking Around, 35
metrics, 31-33
order picking, 36
order processing, 31
postponement, 31
RF (Radio Frequency), 38-40
applied analysis, 43-46
directed putaway, 45
Green Savings, 47
improvements, 46
Lean Savings, 46
order filling, 45-46
order stocking, 45
RFID (Radio Frequency Identity Tags), 56
savings, 37-38
system integration, 28
tracking material flow, 31
Transportation Performance, improving, 35-37
work planning, 31
work planning, WMS (Warehouse Management System), 31
world-class companies, creating
EDI, savings, 14-17
forecasting. *See* forecasting systems
resource management, 3-9

Z

Z transform, 357